



Organisation intergouvernementale pour les transports internationaux ferroviaires  
Zwischenstaatliche Organisation für den internationalen Eisenbahnverkehr  
Intergovernmental Organisation for International Carriage by Rail

**INF. 2**

12 November 2018

(English only)

**RID:** 16<sup>th</sup> Session of the RID Committee of Experts' working group on tank and vehicle technology  
(Krakow, 19 and 20 November 2018)

**Subject:** Risk assessment of extra-large tank-containers

**Information from CEFIC**

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We create chemistry

# CHANCE

# RISK-ASSESSMENT

# RID Committee of Experts





# CHANCE – An integrated solution of innovations...

Fully automated Tank-Container Terminal (TCL)



BASF Class Tank Container (B-TC) with payload up to 66 to



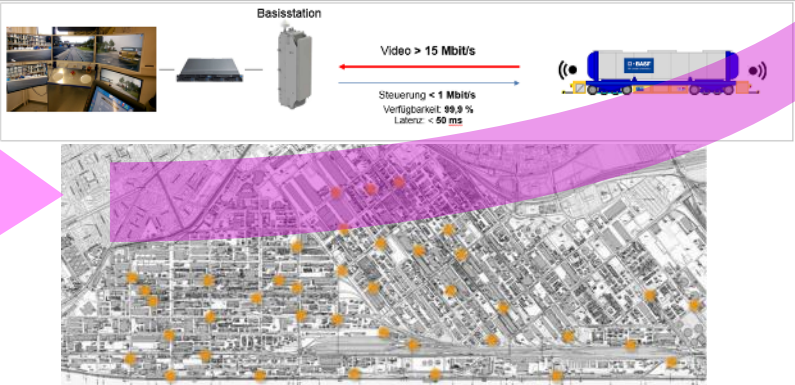
Container carrying wagons for B-TCs



Automated Guided Vehicle (AGV) for internal transports



Transponders on roads across plant and BASF-Wireless-Network



# ...to optimize the rail & site logistics

## Conventional rail transport



Today

22 hours

## Intermodal transport Rail & Road



Future

1 hour



# CHANCE – Fully automated Tank-Container Terminal (TCL)



Capacity [TEU]	2.000
Container Stacking	6 (1+5)
Portal crane	2
Tracks under crane	3
Truck/AGV docking station	8
Operational since	7/2018

# CHANCE – Automated Guided Vehicle (AGV)



Autonomous driving mode

Transponders & Sensors

Tele-operation

Transponders, Sensors & Control-Center

Lenght AGV

16,5 m

Payload AGV

78 Tonnen

Accuracy

± 3cm

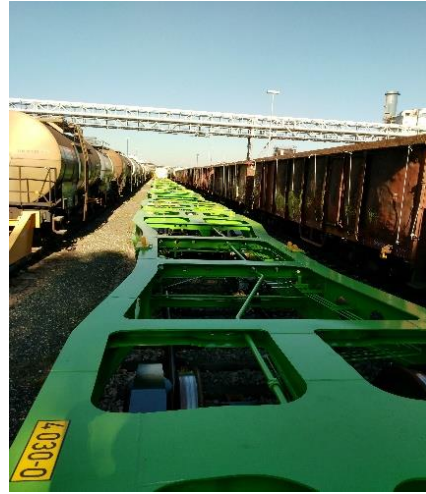
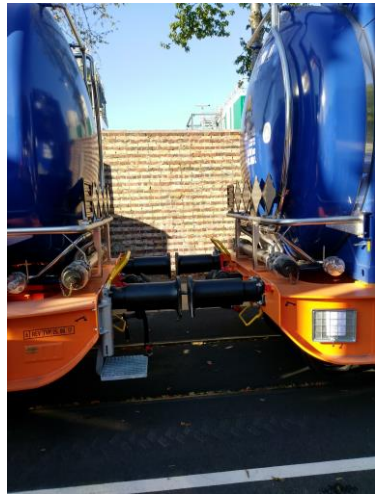
Number / transport volume

8 / 1 million tons per year





# CHANCE – innovative container carrying wagon (iCTW)



Shunting yard

Noise

Length

Dead weight / payload

Count

Possible

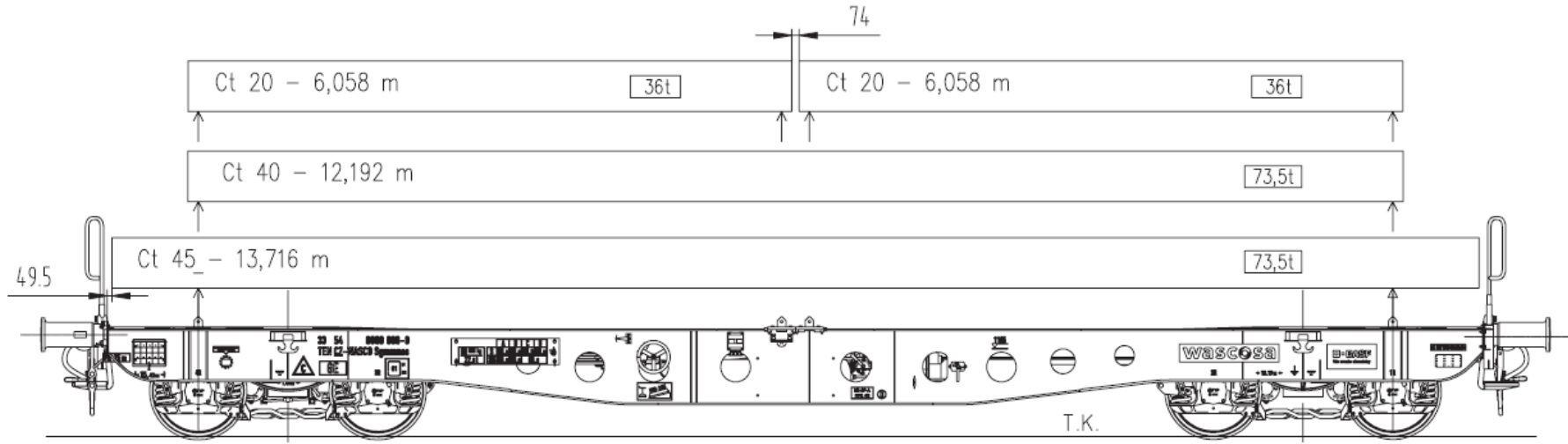
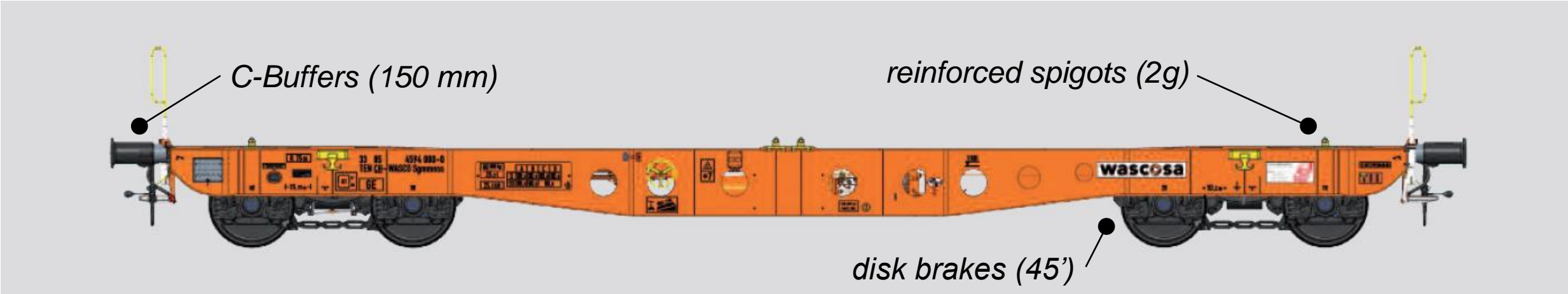
78 dB (45') & 80 dB (52')

15,15 m (45') – 17 m (52')

16,5 t / 73,5 t

342 till mid 2019

# CHANCE – innovative container carrying wagon (iCTW)






# CHANCE – Technical Changes iCTW

Component	Change	Reason
<b>Innovative Container-Carrying-Wagon (iCTW)</b>		
Spigot	reinforced, stronger materials	optimised for higher load
Buffer	Long-Stroke-Buffer (C-Buffer) 150 mm instead of 105 mm	Shunting-yard capability
Wagon-Frame	material, geometry	5-L, optimised for B-TC
Brakes	45' – Disk-brakes 52' – CFCB	Noise-reduction & Life-Cycle

# CHANCE – innovative Container Carrying Wagon (iCTW)

## Approval & Facts


**TÜVRheinland®**  
 Genau. Richtig.

**Bericht über die EG-Prüfung des Teilsystems**  
**Containertragwagen der Bauart Sgmmnss 45' gemäß Zeichnung N-232-00-00-00**  
**nach Modul SB**

Bericht-Nr.: TRRC/B 17/301  
 Datum des Berichtes: 12.07.2017  
 Seitenzahl: 14  
 Bewertungsgegenstand: Containertragwagen der Bauart Sgmmnss 45' gemäß Zeichnung N-232-00-00-00-0  
 Auftraggeber / Hersteller: Tatravagonka a.s.  
 Stefanikova 887/53  
 SK – 058 01 Poprad  
 Auftragnehmer: TÜV Rheinland Rail Certification B.V.  
 Benannte Stelle Interoperabilität Bahn (NoBo 1010)  
 gem. Richtlinie 2008/57/EG  
 Arthur van Schendelstraat 600  
 3511 MJ Utrecht  
 The Netherlands  
 Registration Dossier No. 24.226994  
 TRRC@de.tuv.com  
 Abteilung: RST – Rolling Stock  
 TÜV Rheinland Auftragsnummer: 13104565  
 Angebotsnummer/Datum: TRRC11716 Rev.1 / 15.11.2016  
 Leitender Gutachter: Dipl.-Ing. Tobias Marchand  
 Reviewer: Dipl.-Ing. Jan Wächter  
 Begutachtungsergebnis: Es wurden keine Abweichungen von den Anforderungen der /TSI\_WAG/ und /TSI\_NOI/ an das Teilsystem festgestellt.

Die Ergebnisse beziehen sich ausschließlich auf den Bewertungsgegenstand. Dieser Bericht darf ohne ausdrückliche schriftliche Genehmigung des Auftragnehmers weder auszugsweise veröffentlicht, vervielfältigt noch auszugsweise weitergegeben werden.

iCTW	Count in total 342
In traffic	202
Ordered	140 more in manufacturing process

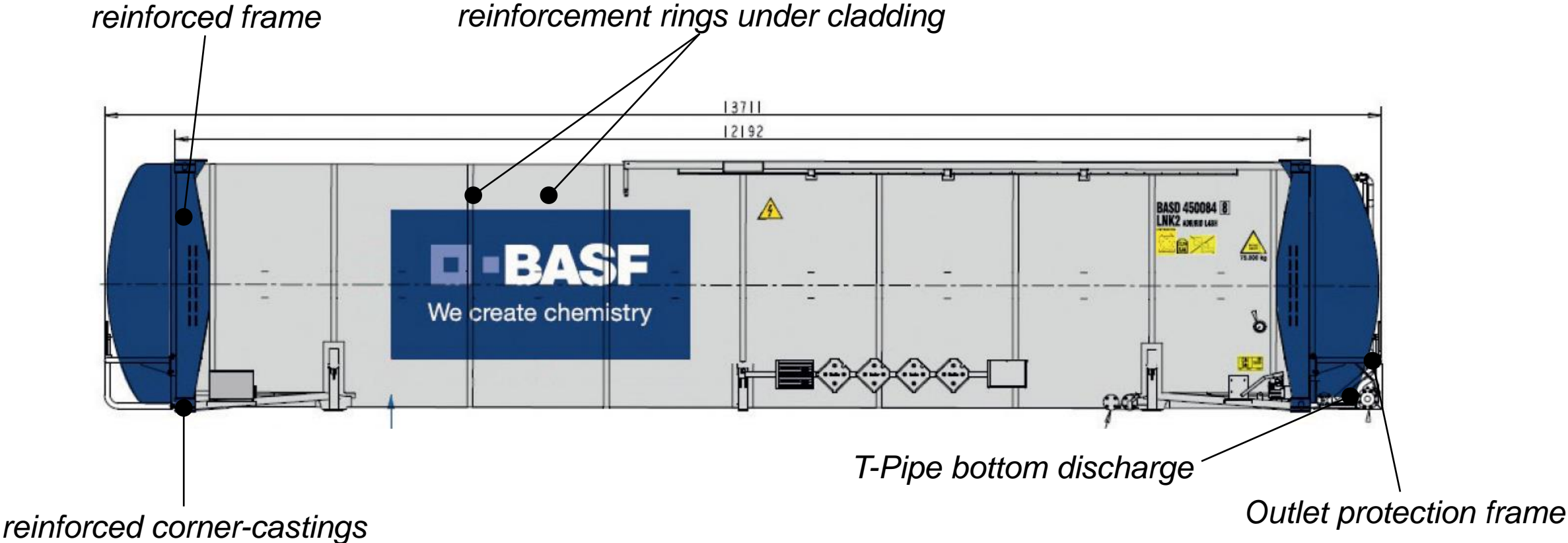


# CHANCE – BASF Class Tank-Container (B-TC)



Length	45' & 52'
Volume	53 – 73 m <sup>3</sup>
Weight	~ 8 t
Stacking	6

# CHANCE – BASF Class Tank-Container (B-TC)





# CHANCE – Facts & Figures

## BASF Class Tank-Container

B-TC	Count in total 950
In traffic	350
Ordered	600 more already in manufacturing

Specification	L4BH	L4BH	L4BH	L4DH	L10BH	L10DH
	standard			specialized		
Length [ft]	45	45	52	45	45	45
Volume [l]	63.000	53.500	73.000	62.000	63.000	62.000
Heating	X	X	X	-	X	X
Insulation	X	X	X	-	X	X
Lining	-	-	-	X	-	-

# Motivation & Objectives Risk-Assessment

8<sup>th</sup> Session of the RID Committee of Experts' standing working Group

Subject: Extra-large tank-containers

Information and Question from Switzerland

Questions regarding the impacts of this innovation related to the risks inherent with the transport of dangerous goods.

- ➔ BASF Class tank-containers are certified and approved since June 2015 for the transport of dangerous goods and since June 2015 in use without incidents.
- ➔ In January 2018 BASF agreed to conduct a Risk-Assessment according to CSM – VO (EU) 402/2013
- ➔ Based on the results BASF intends to propose adjustment suggestions to the current regulations of the conventional and intermodal transport.



# Scope of the Risk-Assessment

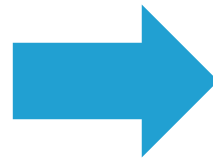


Comparison of the new equipment vs. conventional & intermodal equipment



## comparison of

- driving behavior
- system limits
- surging movements
- technical specifications



## comparison by

- driving trails
- simulations
- impact-tests
- data analysis

# Organization Risk-Assessment



# Risk-Assessment – Technical University of Berlin



**Support for technical analysis, trails, impact-tests, simulations & documentation**



## **Faculty Mechanical Engineering and Transport Systems**

Institute of Land and Sea Transportation Systems

Department of Rail Vehicles, Prof. Dr.-Ing. M. Hecht

*Research:* vehicle dynamics, safety, acoustics, telematics, etc.

*Services:*

- *MKS-Simulations*
- *FE-Models & Analysis*
- *driving behavior data collection & analysis*
- *safety assessment*



# Risk-Assessment – Bureau Veritas



**Independent assessment body**



## **Bureau Veritas Exploitation France**

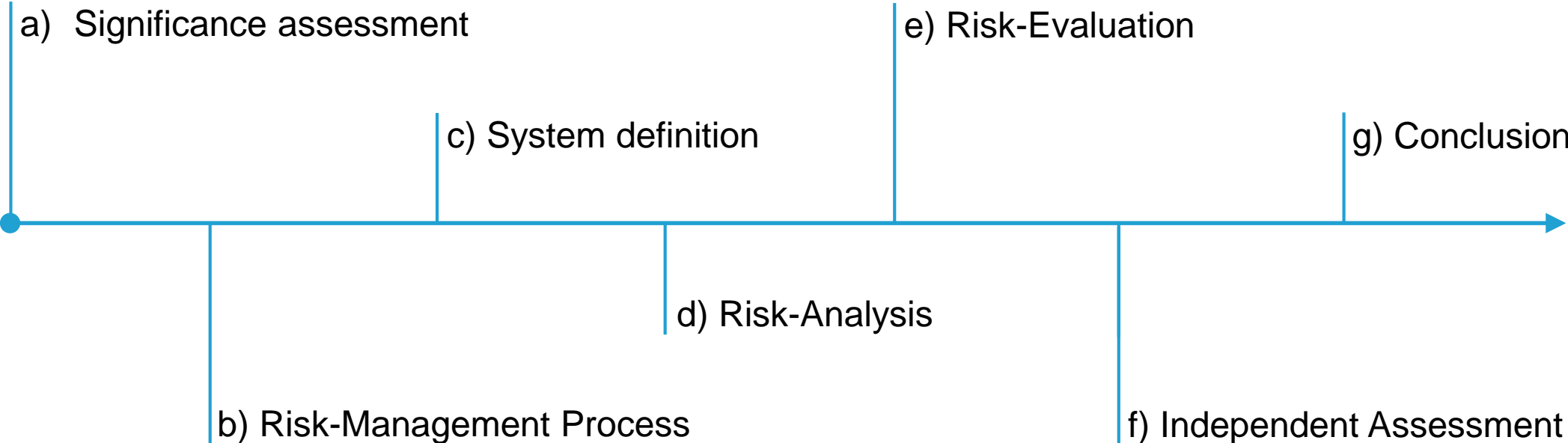
Rail Operations

Ms. B. Scaglione

*Services:*

- *Third-party assessment (notified body)*
- *Technical and safety assistance*
- *Conformity of Assessment*
- *Certification (ECM, IRIS)*

# Risk-Assessment Prozess



Risk-Assessment according to CSM – VO (EU) 402/2013

# Work packages Risk-Assessment

## WP 1

*Comparison and Assessment of the innovative Intermodal System (B-TC & iCTW)*



- *Based on technical documentation*

## WP 2

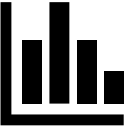
*Experimental trails*



- *Different loadings*
- *Data collection of forces and accelerations*

## WP 3

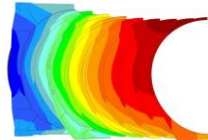
*Modelling and simulation of the driving behaviour*



- *Simulation of system limits*
- *Based on collected and technical data*

## WP 4

*FE-modelling and analysis*



- *Simulation between different systems*
- *Detection of particular stressed positions*

## WP 5

*Impact-Tests*



- *Overriding Impact-Test of different equipment*
- *Voluntarily and additionally to CSM requirements*

## WP 6

*Longterm trails for data collection in different driving situations*



- *3D-acceleration data*
- *Voluntarily and additionally to CSM requirements*

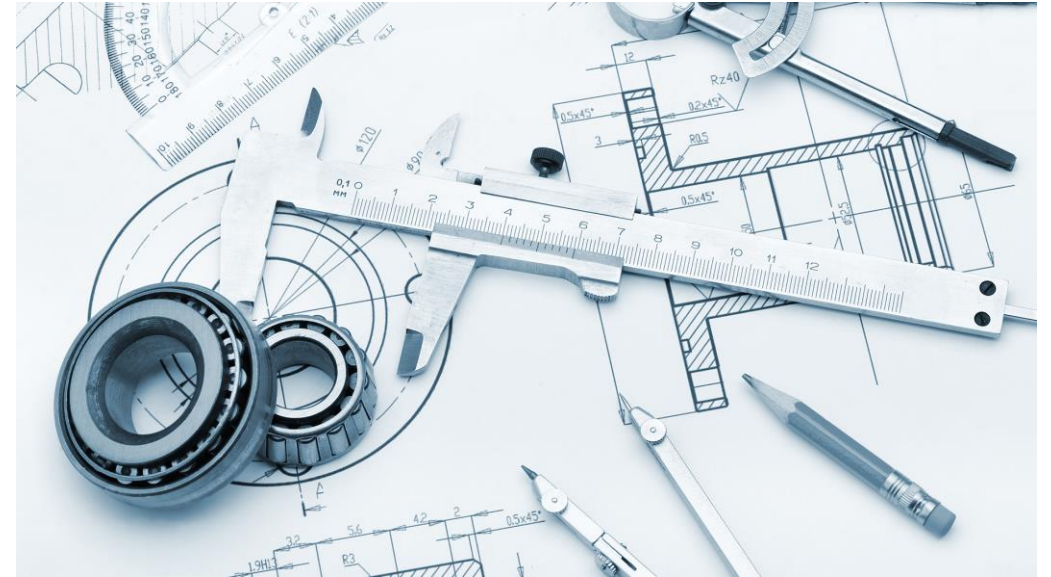


# Work package 1 – Paper based technical comparison

## Comparison of:

- used material
  - material specification
  - material strength
  - etc.
- technical specification
  - payload
  - gross weight, etc.

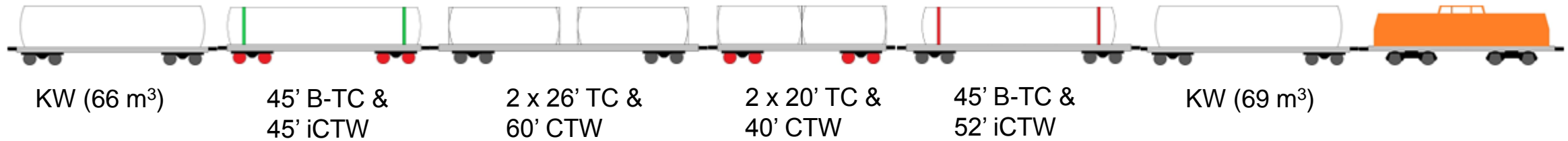
for the different system



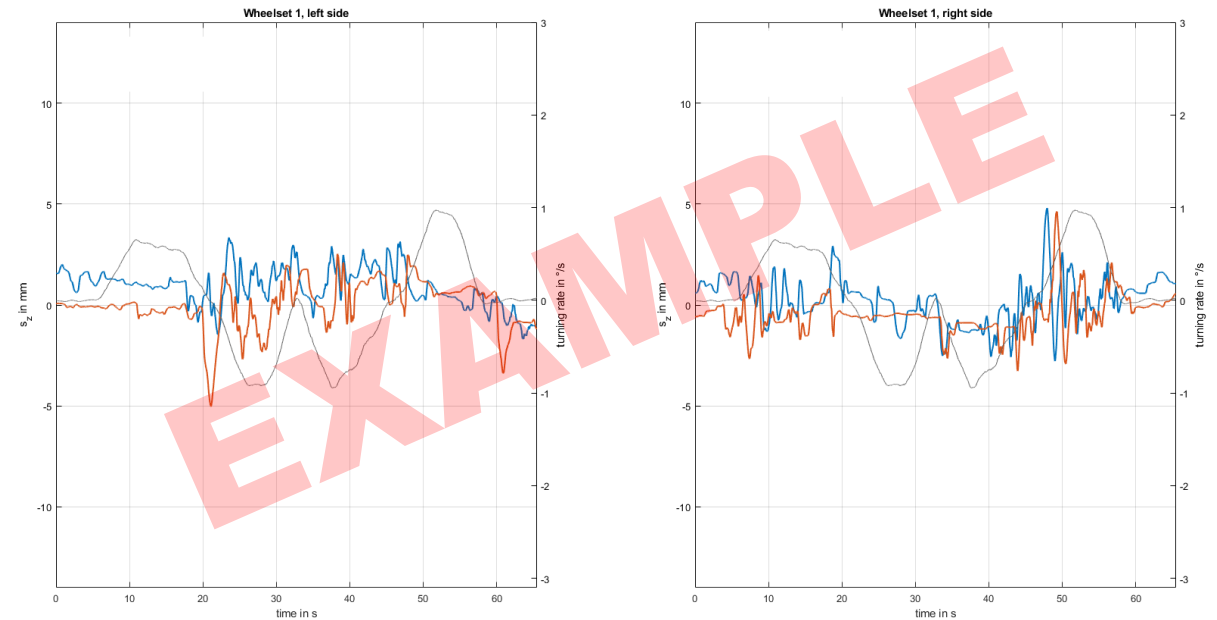
## Objectives:

- System definition
- Risk-Analysis & Detection
- Risk-Evaluation

# Work package 2 – Experimental examinations of the driving behaviour

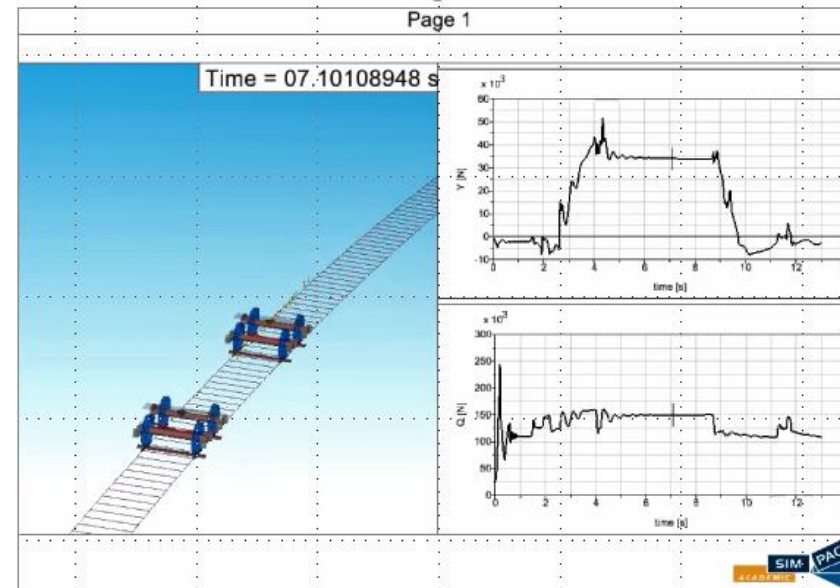
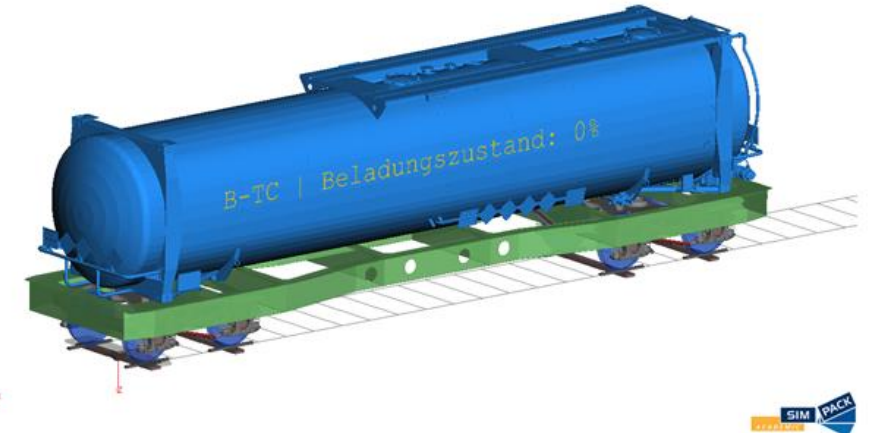


- S-Curve ride
- Loading: 100 %, 50 % & 0 %
- Data gathering: Forces / Acceleration
  - Data-base for simulations
- Comparison of the driving behavior



# Work package 3 – Modelling and simulation of the driving behaviour

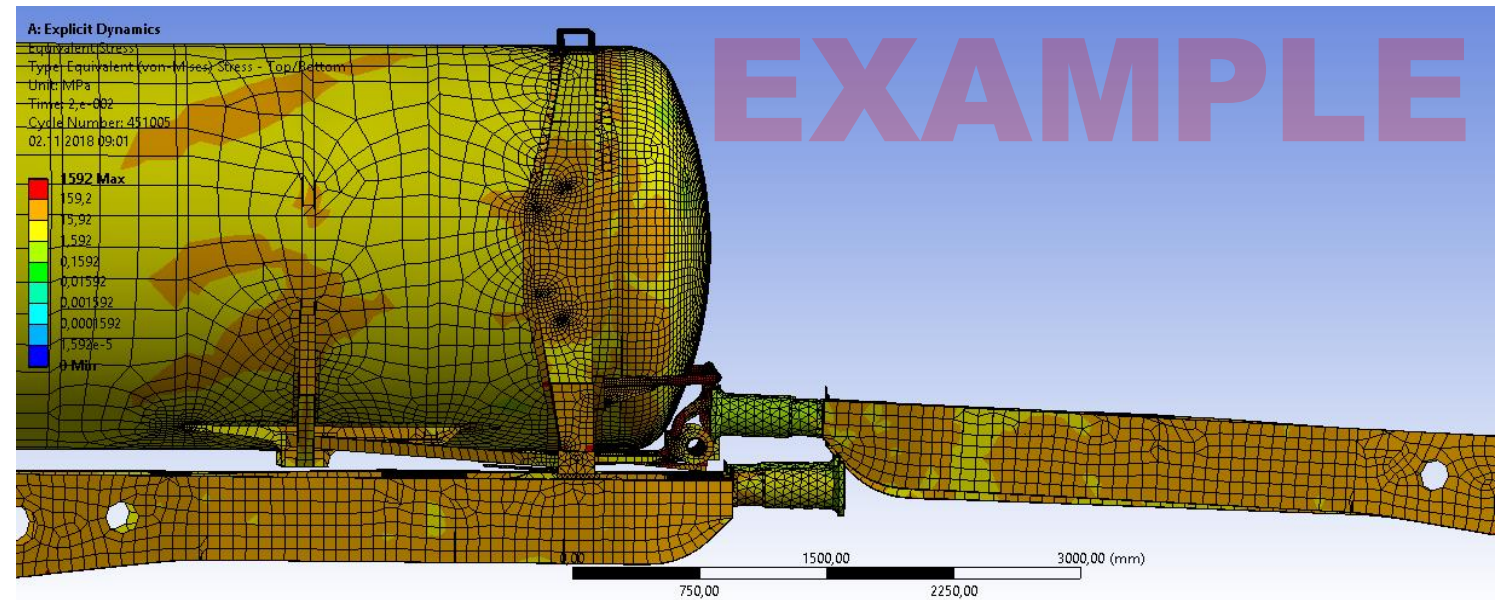
- Assessment of vehicle dynamics
- Comparison of different systems
- Simulation via SIMPACK
- Different simulation scenarios with increasing velocity till failure
  - S-Curve
  - Curve with cant and distortion
  - Crash
  - Specific Topology
- Analysis of Simulation results



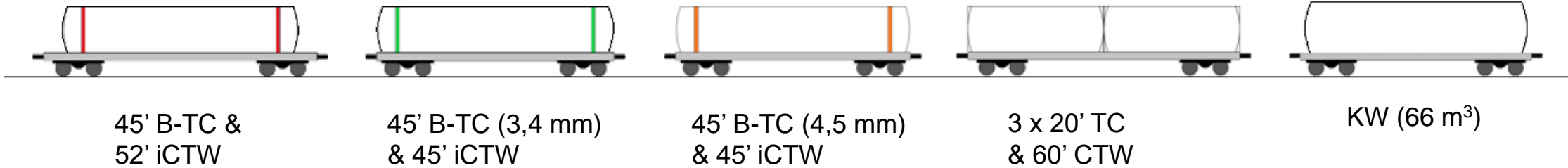


# Work package 4 – FE-Modelling and Analysis of Crash-Scenarios

- FE-Modelling of crash scenarios between different systems
- Scenario: Overriding with different velocities
- Analysis and evaluation of occurring forces & damages

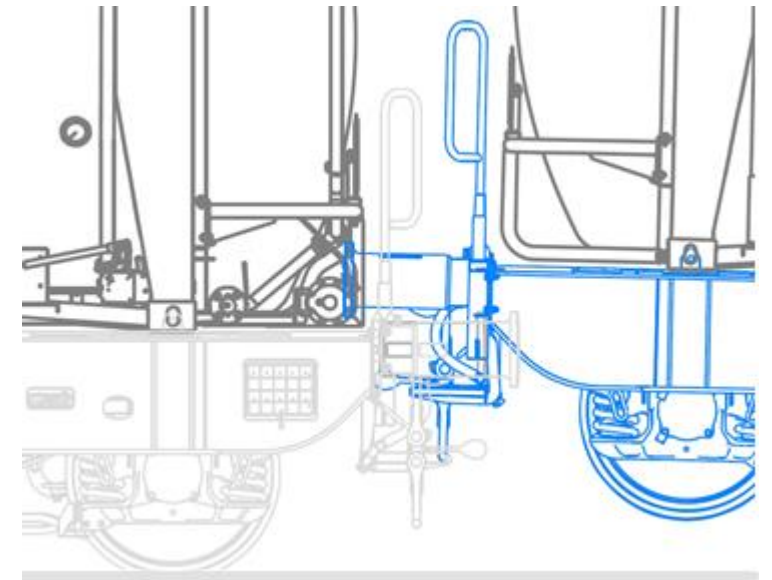


# Work package 5 – Impact-Tests

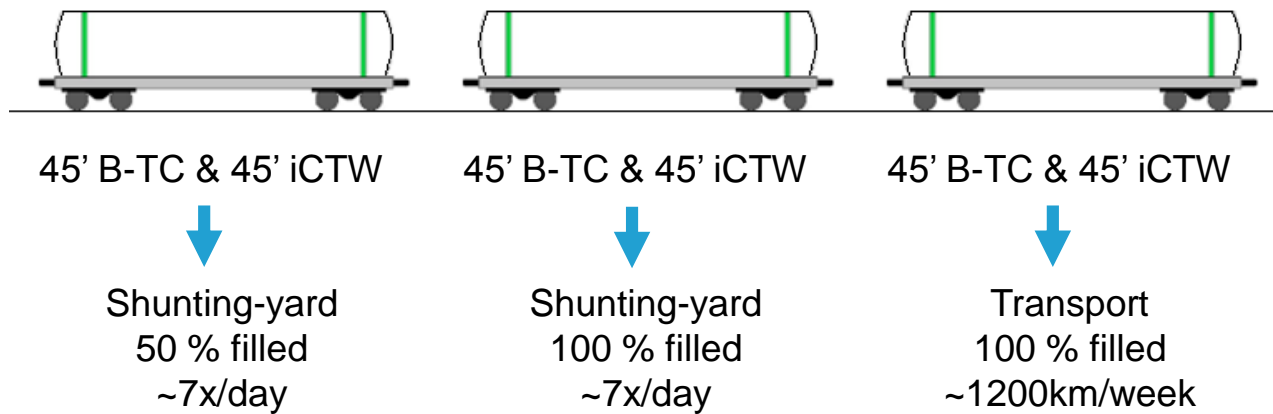


- Impact-Scenario Overbuffering / Overriding
- Experimental assembly based on simulation results (tbd.)
- Comparison of the damage pattern between compared systems
- Analysis of damages

*Voluntarily and additionally to CSM requirements*

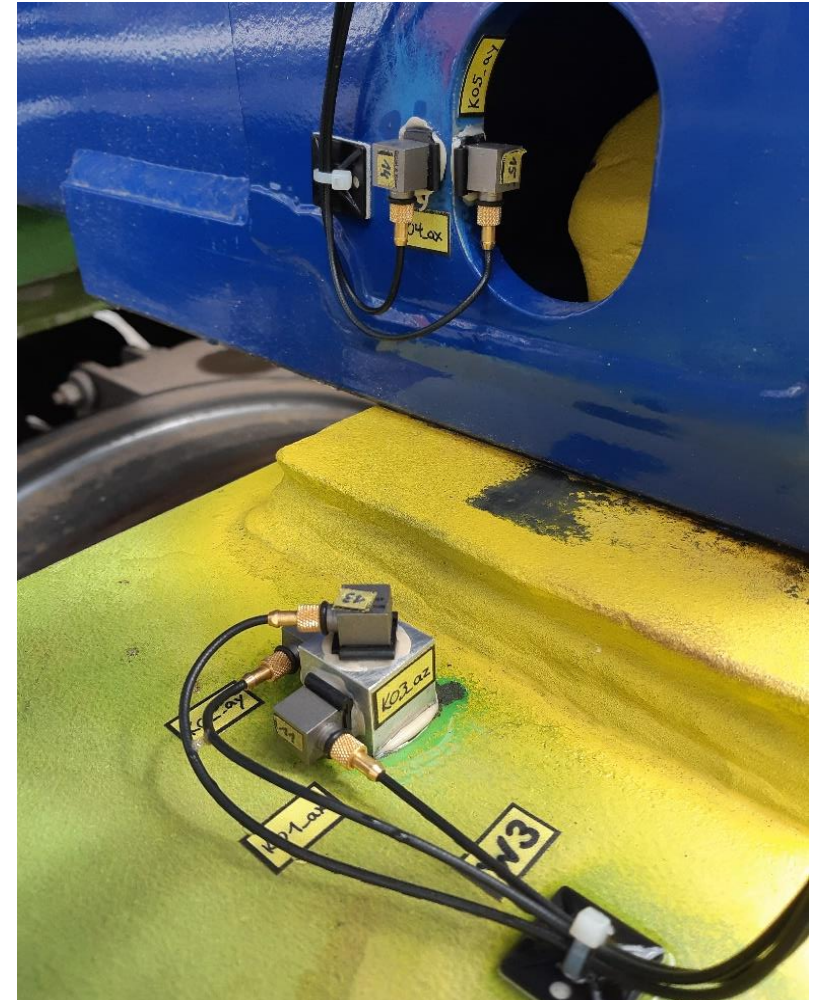


# Work package 6 – Longterm Trails

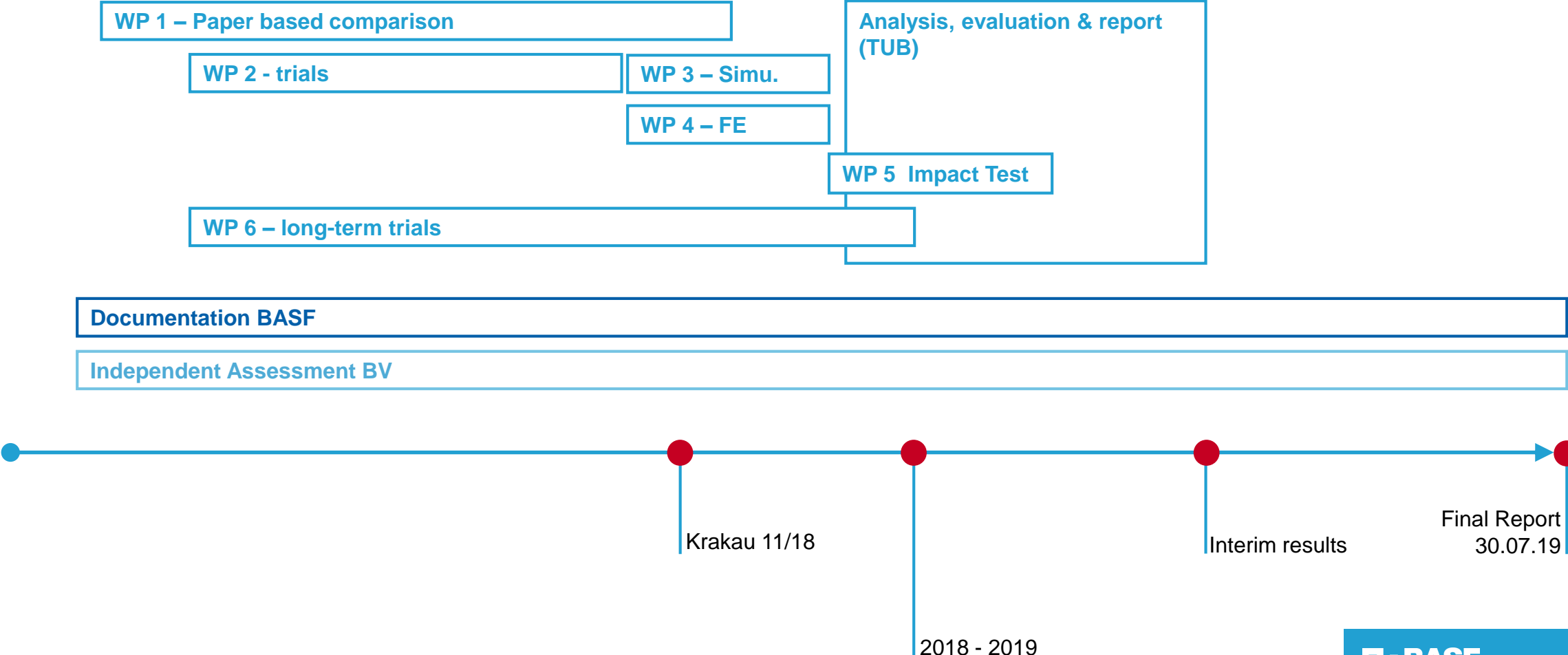


- Data collection of accelerations at B-TC & iCTW in realistic cases
- Analysis of critical impacts
- Analysis of acceleration differences between B-TC & iCTW

*Voluntarily and additionaly to CSM requirements*



# Risk-Assessment schedule





# Risk-Assessment – expected results



## Risk-Evaluation of different systems

- Repercussions of the technical changes
- Scientific comparison between new, conventional and intermodal systems



## Suggestions for existing regulations

- Tank Construction (e.g. different wall-thickness for the three investigated systems)
- 20t load for disc brakes
- Labelling for handling of new system (crane & spigots)
- Additional safety measures for a few chemicals (e.g. increased distance between tank and buffers)
- Minimum filling degree in rail transport (80/20 regulation for tank containers)



We create chemistry